

## CLAIMS

1. A wireless headphone assembly, comprising:  
at least one ultrasound receiver for receiving at least one ultrasound signal along at least one ultrasound channel; [and]  
at least one transducer for converting each of said at least one ultrasound signal along said at least one ultrasound channel to a human audible signal[.], and wherein said two ultrasound receivers, called a right receiver and a left receiver, provide ultrasound signals to right and left ears of a user, wherein the right receiver provides a front right signal to the right ear and the left receiver provides a front left signal to the left ear, and wherein the right receiver provides a rear left signal to the left ear and the left receiver provides a rear right signal to the right ear.
2. The wireless headphone assembly according to claim 1 and wherein said at least one ultrasound receiver comprises two ultrasound receivers, each of which receives an ultrasound signal along two ultrasound channels.
- [3. The wireless headphone assembly according to claim 2 and wherein said two ultrasound receivers, called a right receiver and a left receiver, provide ultrasound signals to right and left ears of a user, wherein the right receiver provides a front right signal to the right ear and the left receiver provides a front left signal to the left ear, and wherein the right receiver provides a rear left signal to the left ear and the left receiver provides a rear right signal to the right ear.]
- [4] 3. The wireless headphone assembly according to claim 1 and wherein said at least one ultrasound receiver comprises four ultrasound receivers, each of which receives an ultrasound signal along one ultrasound channel.
- [5. The wireless headphone assembly according to claim 1 and wherein said at least one transducer comprises at least one first transducer which converts said at least one ultrasound signal to at least one modulated electrical signal and at least one second transducer which converts said at least one modulated electrical signal to a human audible signal.]
- [6. The wireless headphone assembly according to claim 5 and wherein said at least one transducer comprises at least one multichannel transducer.]

[7. The wireless headphone assembly according to claim 1 and also comprising at least one band pass filter associated with each ultrasound channel.]

[8. The wireless headphone assembly according to claim 1 and also comprising at least one demodulator associated with each ultrasound channel.]

[9] 4. The wireless headphone assembly according to claim 1 and wherein said at least one first transducer is operative to convert said at least one ultrasound signal to at least one modulated electrical signal, comprises at least two first transducers, each arranged to be located adjacent a different ear of a user.

[10] 5. The wireless headphone assembly according to claim 1 and wherein said at least one [second] transducer comprises at least two second transducers, each providing a human audible output to a different ear of a user.

[11] 6. The wireless headphone assembly according to claim [10] 5 and wherein a human audible signal derived from ultrasound signals received at each of said at least two ultrasound receivers is supplied to each ear of a user.

[12] 7. The wireless headphone assembly according to claim [11] 6 and wherein:  
said at least two ultrasound receivers each receive ultrasound signals along at least two ultrasonic channels;

said at least two second transducers convert ultrasound signals along at least two human audible channels to human audible signals; and

information received along each one of said at least two channels of each of said at least two ultrasound receivers is supplied to each of two different ears of the user along a separate one of said human audible channels.

[13] 8. The wireless headphone assembly according to claim [12] 7 and comprising delay lines operative to simulate the acoustic delay occurring between the arrival of sound from a signal source at the two ears of the user.

[14] 9. A headphone system providing a simulated multi-source sound environment, comprising:

at least one headphone assembly which may be worn by a user, including:

at least [one] two ultrasound receivers for receiving at least one ultrasound signal along at least [one] two ultrasound channels; and

at least one transducer for converting each of said at least one ultrasound signal along said at least [one] two ultrasound channels to a human audible signal;

at least one processor receiving a multi-source signal and modulating an ultrasound carrier along a plurality of channels, in accordance with said multi-source signal; and

at least one transmitter for transmitting said modulated ultrasound carrier to the at least one headphone assembly along said plurality of channels [.] wherein the use of ultrasound for transmitting said modulated carrier to said at least one headphone assembly is operative to cause a listener using said headphone assembly to experience surround sound effects that said listener would experience if the multi-source signal were transmitted in free space as audible sound waves from suitably located sound sources.

[15. The headphone system according to claim 14, and wherein the use of ultrasound for transmitting said modulated carrier to said at least one headphone assembly is operative to cause a listener using said headphone assembly to experience psycho-acoustic effects that said listener would experience if the multi-source signal were transmitted in free space as audible sound waves from suitably located sound sources.]

[16] 10. A headphone system, comprising:

a headphone assembly which may be worn by a user; and

two audio receivers, called a right receiver and a left receiver, mounted in said headphone assembly, said receivers providing received audio signals to right and left ears of the user, wherein the right receiver provides a front right signal to the right ear and the left receiver provides a front left signal to the left ear, and wherein the right receiver provides a rear left signal to the left ear and the left receiver provides a rear right signal to the right ear.

[17. A method for simulating an artificial sound environment comprising:

converting an audible signal to an ultrasound wave;

receiving said ultrasound wave by means of a wireless headphone assembly,

and

converting said ultrasound wave to an audible signal by means of said wireless headphone assembly.]

[18] 11. A method for simulating an artificial sound environment, comprising:

    sending an ultrasound reference signal to a headphone assembly worn by a user having two ears, said headphone assembly audibly providing at least one audio signal to each of the ears;

    processing arrival times of said ultrasound reference signal at each said ear, so as to measure a phase difference of said signal as perceived by one said ear in contrast to the other ear and to measure a distance between the two ears of the user;

    modulating at least two audio signals, at least one signal for each said ear, in accordance with said [phase] measured difference; and

    sending said at least two audio signals via said headphone assembly to each of the ears.

[19] 12. The method according to claim [18] 11 and comprising sending said at least two audio signals and said ultrasound reference signal via an ultrasound carrier.

[20] 13. The method according to claim [18] 11 and wherein the step of sending said at least two audio signals comprises sending the signals to said headphone assembly by wired communication.

[21] 14. The method according to claim [18] 11 and wherein the step of sending said at least two audio signals comprises sending the signals to said headphone assembly by wireless communication.

15. A method for simulating an artificial sound environment, comprising:

providing a headphone system as claimed in claim 10;

measuring the distance between the ears of a user wearing said headphone assembly, and

producing an artificial sound environment in consideration of said measured distance and in response to any linear and/or angular motion of the user's head.